

WHAT IS CLAIMED IS:

1. A DNA inspection method comprising irradiating a sample having a DNA piece added with a plurality of L kinds of fluorescence-marked materials combined to corresponding DNA with minute spot excitation lights having a plurality of M kinds of wavelengths in accordance with said fluorescence-marked materials, separately detecting fluorescence intensities obtained in accordance with said fluorescence-marked materials, and changing said spot excitation lights and a position on the sample irradiated with said spot excitation lights over a desired area relatively by the number of times smaller than the number L of kinds of the fluorescence-marked materials to inspect said DNA added with said plurality of L kinds of fluorescence-marked materials.
2. A DNA inspection method according to Claim 1, wherein said relatively changing operation of said spot excitation lights and the position on the sample irradiated with said spot excitation lights over the desired area is made once.
3. A DNA inspection method according to Claim 1, wherein said plurality of M kinds of minute spot excitation lights are a plurality of N minute multi-spot excitation lights.
4. A DNA inspection method according to Claim 1, wherein different positions on the sample from one another are irradiated with said plurality of M kinds

20250709 011302

of multi-spot excitation lights.

5. A DNA inspection method according to Claim 1, wherein irradiation with said plurality of M kinds of multi-spot excitation lights is made at the same time and fluorescence obtained by said plurality of kinds of minute spot excitation lights in accordance with said fluorescence-marked materials is detected by a plurality of K weak-light detection elements in accordance with respective excitation lights, the fluorescence intensities obtained in accordance with the fluorescence-marked materials being detected separately.

6. A DNA inspection method according to Claim 1, wherein irradiation with said plurality of M kinds of minute spot excitation lights is made in time series manner in accordance with wavelengths of said excitation lights and fluorescence obtained by said plurality of kinds of minute spot excitation lights in accordance with said fluorescence-marked materials is detected by a common weak-light detection element to respective excitation lights, the fluorescence intensities obtained in accordance with the fluorescence-marked materials being detected separately.

7. A DNA inspection method according to Claim 6, wherein substantially the same position is irradiated with said plurality of M kinds of minute spot excitation lights.

8. A DNA inspection method according to Claim 1,

10053976.011802

wherein said plurality of M kinds of minute spot excitation lights are turned on and off in different time zone within a time that a relative position of said spot excitation lights and said sample to be irradiated is changed by substantially one pixel.

9. A DNA inspection method according to Claim 1, wherein said plurality of M kinds of minute spot excitation lights are changed stepwise at respective excitation light intensity levels within a time that a relative position of said spot excitation lights and said sample to be irradiated is changed by substantially one pixel to detect the fluorescence intensity at each step, so that detection is made over a wide dynamic range at a high speed.

10. A DNA inspection method according to Claim 1, wherein said separate detection of fluorescence intensities is made by a photon-counting method.

11. A DNA inspection apparatus comprising one to a plurality of light sources for emitting lights having a plurality of M kinds of wavelengths different from one another, a plurality-of-wavelength excitation optical system for irradiating a DNA sample added with a plurality of L kinds of fluorescence-marked materials with lights having said plurality of wavelengths from said light sources as minute spot excitation lights, a wavelength separation fluorescence detection system for separately detecting fluorescence intensities obtained by the respective excitation lights in accordance with

10053976-011802

10053976-011802

said fluorescence-marked materials, a driving stage for changing a relative position of said minute spot excitation lights and said DNA sample over a desired area, plurality-of-fluorescent-mark simultaneous processing means for constructing fluorescent image information of a plurality of L kinds of fluorescence-marked DNA on said sample from fluorescence detection information and fluorescence detection position information obtained by scanning said desired area once in response to change of said relative position, means for collectively processing information obtained by said plurality-of-fluorescent-mark simultaneous processing means and storing inspection result, and output means for outputting the result stored in said storing means in a desired output format.

12. A DNA inspection apparatus according to Claim 11, wherein said plurality-of-wavelength excitation optical system produces, as said minute spot excitation lights, N multiple spots having said respective different wavelengths.

13. A DNA inspection apparatus according to Claim 11, wherein said light source or said plurality-of-wavelength excitation optical system includes means for turning on and off said excitation lights having respective wavelengths alternately in time series manner.

14. A DNA inspection apparatus according to Claim 11, wherein said light source or said plurality-of-

wavelength excitation optical system includes means for changing intensities of said excitation lights having respective wavelengths in accordance with detected fluorescence intensities.

15. A DNA inspection apparatus according to Claim 1, wherein said wavelength separation fluorescence detection system makes detection by counting photons.

16. A fluorescence detection method comprising irradiating a sample containing a plurality of L kinds of fluorescent materials with minute spot excitation lights having a plurality of M kinds of wavelengths in accordance with said fluorescent materials, separately detecting fluorescence intensities obtained in accordance with said respective fluorescent materials, and changing said spot excitation lights and a position on the sample irradiated with said spot excitation lights over a desired area relatively by the number of times smaller than the kinds L of said fluorescent materials to detect fluorescence on said sample added with said plurality of L kinds of fluorescent materials.

17. A fluorescence detection method according to Claim 16, wherein said relatively changing operation of said spot excitation lights and the position on the sample irradiated with said spot excitation lights over the desired area is made once.

10053976-011802